TRICKY ARITHMETIC BY SUNIL KHARUB

TRICKY ARITHMETIC

For HSSC/SSC/BANK

Hindi/English Both
Medium Class Notes

by MATHS GURU
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SPECIAL EDITION

SOLVE ARITHMETIC IN JUST 30 SECONDS WITHOUT USE OF PEN & PENCIL

PERCENTAGE
PROFIT & LOSS
SI & CI

anant PUBLICATION

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How To calculate % QUICKly

520 ⟶ 100 %.
⟶ 10 % = 52
⟶ 1 % = 5.2
⟶ .1 % = .52

21 % of 520
= 10 % + 10 % + 1 %
= 52 + 52 + 5.2
= 109.2 ANS.

27 % of 520
= 25 % + 1 % + 1 %
= $\frac{1}{4}$ × 520 + 5.2 + 5.2
= 130 + 10.4 = 140.4

57 % of 520
= 50 % + 5 % + 2 %
= 260 + 26 + 5.2 + 5.2
= 286 + 10.4
= 296.4 ANS.

144 is what % of 450
= $\frac{144}{450}$ × 100
= $\frac{(135+9)}{450}$ × 100
= $\frac{135}{450}$ × 100 + $\frac{9}{450}$ × 100
= 30 % + 2 % = 32 % ANS.

126 is what % of 450
= $\frac{126}{450}$ × 100
= $\frac{135-9}{450}$ × 100
= $\frac{135}{450}$ × 100 − $\frac{9}{450}$ × 100
= 30 % − 2 % = 28 %

138 is what % of 476
= $\frac{138}{476}$ × 100
= $\frac{(119+19)}{476}$ × 100
= $\frac{119}{476}$ × 100 + $\frac{19}{476}$ × 100
= 25 % + 4 % ≅ 29 %

63 % of 560
= (62.5 % + .5 %) of 560
= $\frac{5}{8}$ × 560 + 2.8
= 350 + 2.8
= 352.8 ANS.

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A reduction ~~in~~ of 25% in the price of sugar enables a housewife to purchase 4 kg more for ₹ 800. Find original and current price per kg?

Solution :→ Here Expenditure = CONSTANT = 800

$\Rightarrow$ Price $\propto \frac{1}{\text{CONSUMPTION}}$

$25\%\downarrow = -\frac{1}{4} \rightarrow$ old $\Rightarrow$ New $= 4-1=3$

	old		New
price	4	:	3
consump	3	:	4
			$+1 \rightarrow 4$

$\Rightarrow$ old consumption $= 3\times4 = 12$kg

New consumption $= 4\times4 = 16$kg

OR DIRECT
25% of 800 = 200
New/Reduced Price $= \frac{200}{4} = 50$
old $\Rightarrow$ 75% → 50
100% → $66\frac{2}{3}$

(i) old price $= \frac{800}{12} = 66\frac{2}{3}$ ₹/kg (ii) New/current price $= \frac{800}{16} = 50$

Due to 30% increase in price of apples, 6 apples are less available for ₹ 520. Find the old and new price of a apple?

Solution :— $30\%\uparrow = \frac{+3}{10}$

	old		New
price	10	:	13
CONS.	13	:	10
			$-3 \rightarrow 6$
			$1 \rightarrow 2$

old CONS. $= 13\times2 = 26$

old price $= \frac{520}{26} = 20$₹

New Consumpt. $= 10\times2 = 20$

New Price $= \frac{520}{20} = ₹26$

OR DIRECT
30% of 520 = 156
New price $= \frac{156}{6} = 26$
old → 130% — 26
100% → 20

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If the Income Tax is increased by 19%, then Net income will be decreased by 6%. Find the Rate of income tax?

Solution:- [CONCEPT] Net Income = Income − Tax

$\Rightarrow$ Net Income + Tax = INCOME

in these type of questions Income is same

Note:- If Tax is ↑ by ₹x, Net Income will be decreased by ₹x. OR vice-versa but % may vary.

e.g. $\begin{matrix} NI & T & I \\ 50 & + 30 & = 80 \\ 45 & + 35 & = 80 \end{matrix}$] same

TRICKY:- ↓ Income is same ↓

19% of Tax = 6% of Net Income

$\Rightarrow \frac{19}{6} = \frac{\text{Net Income}}{\text{Tax}} \Rightarrow$ Income = 19+6 = 25

$\text{Tax \%} = \frac{\text{Tax}}{\text{income}} \times 100 = \frac{6}{25} \times 100 = 24\%$ ANS.

If income Tax is increased by 19%, Net income get decreased by 1%. Find the Tax Rate?

Solution:- 19% of Tax = 1% of Net INCOME

$\Rightarrow \frac{\text{Tax}}{\text{Net Income}} = \frac{1}{19} \Rightarrow$ Income = 1+19 = 20

$\text{Tax \%} = \frac{1}{20} \times 100 = 5\%$ ANS.

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36 संतरे बेचने पर एक दुकानदार को 4 संतरों के विक्रय मूल्य के बराबर लाभ होता है। लाभ % क्या होगा?

Solution :- I (Basic) OR II (Tricky)

SP of 36 − CP of 36 = SP of 4

⇒ SP of 32 = CP of 36

OR $\frac{CP}{SP} = \frac{32}{36} = \frac{8}{9}$

लाभ % $= \frac{1}{8} \times 100 = 12.5\%$

माना 1 संतरे का वि० मू० = 1 ₹

लाभ = 4 संतरों का वि० मू० = 4

36 संतरों का वि० मू० = 36

⇒ 36 संतरों का क्र० मू० = 36 − 4 = 32

∴ लाभ % $= \frac{4}{32} \times 100 = 12.5$

36 संतरे बेचने पर एक दुकानदार को 4 संतरों के क्र० मू० के बराबर हानि होती है? हानि प्रतिशत क्या होगा?

Solution :- I (Basic) II (Tricky)

CP of 36 − SP of 36 = CP of 4

⇒ CP of 32 = SP of 36

⇒ $\frac{CP}{SP} = \frac{36}{32} = \frac{9}{8}$

Loss % $= \frac{1}{9} \times 100 = 11\frac{1}{9}\%$

माना 1 संतरे का CP = 1 ₹

हानि = 4 संतरों का CP = 4 ₹

36 संतरों का CP = 36 ₹

हानि % $= \frac{4}{36} \times 100 = 11\frac{1}{9}\%$

36 संतरे बेचने पर एक दुकानदार को 4 संतरों के विक्रय मूल्यों के बराबर हानि होती है। हानि % क्या होगा?

Solution :- I (BASIC) II (TRICKY)

CP of 36 − SP of 36 = SP of 4

⇒ CP of 36 = SP of 40

OR $\frac{CP}{SP} = \frac{40}{36}$

∴ हानि % $= \frac{4}{40} \times 100$

$= 10\%$ Ans.

माना 1 संतरे का वि० मू० = 1 ₹

हानि = 4 संतरों का SP = 4

36 संतरों का SP = 36

⇒ 36 संतरों का CP = 36 + 4 = 40

हानि % $= \frac{4}{40} \times 100 = 10\%$

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A man buys some Articles for ₹ 4800. He sells $\frac{2}{5}$th of the articles at a Profit of 25%. At what Price should he sell the Remaining articles so that he gains 19% on a whole?

Solution :- I

Let Total Articles = 5
कुल 5 | 25% पर 2 | शेष 3

$\times 19\left(\quad \left(\times 25 \right. \right) \div 3$

$95\% - 50\% = 45\%$

$= 15\%$ Ans.

II (Alligation)

X% 25%

19%

3 : 2

$\Rightarrow \frac{25-19}{19-x} = \frac{3}{2}$

$\Rightarrow x = 15\%$ Ans.

IIIrd) $\frac{2}{5}(25\%) + \frac{3}{5}(x\%) = 19\%$

$\Rightarrow 50\% + 3x\% = 95\% \Rightarrow x = 15\%$

In what Ratio must water be mixed with milk to gain 20% on selling the mixture at COST Price?

Solution :- Alligation (I)

Let CP of 1 ltr of milk = 1₹

CP of 1 ltr of water = 0

SP of 1 ltr of mixture = 1

Now CP of 1 ltr of mix = $\frac{100}{120} \times 1 = \frac{5}{6}$

w m

0 1

$\frac{5}{6}$

1 : 5

w : m = 1 : 5

II (TRICKY)

$20\% = \frac{1}{5} \rightarrow w$

$\rightarrow m$

w : m = 1 : 5

[क्योंकि जो Profit होगा वो पानी के कारण ही होगा]

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A man purchased two watches for ₹ 840. If he sells one at 16% profit and other at 12% loss then he get no profit no loss in whole Transaction. Find the CP of each watch?

Solution :- I (BASIC)

Let $CP_1 = x \Rightarrow CP_2 = 840 - x$.

$$x * \frac{88}{100} + (840-x) \times \frac{116}{100} = 840$$

$$x = 480 = CP_1 \Rightarrow CP_2 = 360$$

II (Alligation)

-12 16

0

16 : 12

4 : 3

$CP_1 = \frac{840}{7} \times 4 = 480$

$CP_2 = 360$

III (TRICKY)

$16\,CP_1 = 12\,CP_2$

$\Rightarrow \frac{CP_1}{CP_2} = \frac{3}{4}$

$7 \longrightarrow 840$

$1 \longrightarrow 120$

$CP_1\,(3) - 360$

$CP_2\,(4) - 480$

एक व्यक्ति दो वस्तुओं को 1250 ₹ में बेचता है। वह एक को 5% की हानि पर और दूसरे को 20% के लाभ पर बेचता है। अगर उसे पूरे व्यवसाय में न लाभ और न ही हानि होती है। तो दोनों वस्तुओं का अलग-2 क्रय मूल्य ज्ञात करो?

Solution I (BASIC)

let CP_1 (5% L) = x

$\Rightarrow CP_2$ (20% P) = 1250 - x

$$x * \frac{95}{100} + (1250-x)\frac{120}{100} = 1250$$

$$\Rightarrow \frac{-25x}{100} = -1250 \times \frac{20}{100}$$

$$x = 1000$$

$CP_2 = 1250 - 1000 = 250$

II (Alligation)

-5% 20%

0

20 : 5

4 : 1

$5 \longrightarrow 1250$

$4 \longrightarrow 1000\,(CP_1)$

$1 \longrightarrow 250\,(CP_2)$

III (TRICKY)

$5CP_1 = 20CP_2$

$\frac{CP_1}{CP_2} = \frac{4}{1}$

$5 \longrightarrow 1250$

$4 \longrightarrow 1000\ CP_1$

$1 \longrightarrow 250\,(CP_2)$

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₹ 425 amounts to ₹ 476 in 3 yrs at certain Rate of interest. Find Rate of interest?

Solution:- $A = P + SI$

$\downarrow$ 100%

P 425 $\longrightarrow$ 100%.

A 476 $\longrightarrow \frac{100\%}{425} \times 476 \longrightarrow 112\%$.

$SI = A - P = 112\% - 100\% = 12\% = RT\%$.

but $T = 3$ yrs $\Rightarrow R\% = \frac{12}{3} = 4\%$. Ans.

A certain principle in four years will become 3 times. Find the Rate?

Solution:-

I (FORMULA)

P = X, A = 3X

SI = 2X

$2X = \frac{X * 4 * R}{100}$

$\Rightarrow R = 50\%$ Ans

II (CONCEPT)

A = P + SI

P = 100% A = 300%.

$\Rightarrow SI = 200\% = RT$

but $T = 4$ yrs

$\therefore R = \frac{200}{4} = 50\%$.

III (DIRECT)

$R = \frac{(N-1)}{T} \times 100$

$= \frac{3-1}{4} \times 100$

$= 50\%$.

कोई राशि 5% वार्षिक साधारण ब्याज की दर से एक निश्चित समय में दुगुनी हो जाती है। समय ज्ञात कीजिए?

Solution:-

I (FORMULA)

P = X, A = 2X

X = SI

$X = \frac{X * 5 * T}{100}$

$\Rightarrow T = 20$ yrs Ans

II (CONCEPTUAL)

A = P + SI

P = 100%. A = 200%.

SI = 100% = RT%

but R = 5%.

$\Rightarrow T = \frac{100}{5} = 20$ yrs

III (DIRECT)

$R = \frac{N-1}{T} \times 100$

$5 = \frac{2-1}{T} \times 100$

$\Rightarrow T = 20$ yrs

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A man lent 2000 partially at 5% p.a. and balance at 4% p.a. If he receives ₹ 92 as annual interest. Find the amount lent at 5%?

Solution:- I (BASIC)

Let X ₹ invested @ 5%.

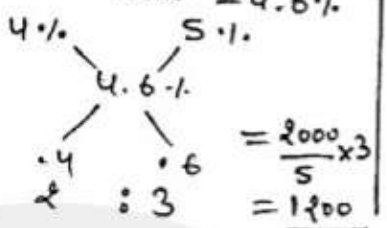
⇒ 5% of X + (2000 − X) 4% = 92

⇒ 5X − 4X − 8000 = 9200

⇒ X = 1200 Ans

II (Alligation)

R% = $\frac{92}{2000} \times 100 = 4.6\%$



$= \frac{2000}{5} \times 3$

$= 1200$

III (रामबाण)

Let whole amnt @ 4%.

$SI = \frac{2000 \times 4}{100} = 80$

gap = 92 − 80 = 12

5% − 4% → 12

1% → 12

100% → 1200

A man lent ₹ 1600 part of which he lent at 4% and Rest at 5% p.a. SI. If the total interest Received was ₹ 700 in one year, the money lent at 4% was?

Solution:- I (Alligation)

overall R% = $\frac{700}{16000} \times 100$

$= \frac{350}{80}$

80 × 4% 5% × 80

$\frac{350}{80} \times 80$

50 : 30

5 : 3

at 4% = $\frac{16000}{8} \times 5$

= 10,000 Ans.

II (रामबाण)

let all (16000) @ 5%.

$SI = \frac{16000 \times 5}{100} = 800$

gap 800 − 700 = 100

5% − 4% → 100

1% → 100

100% → 10000

(जिसको मानेंगे वो नहीं आएगा दूसरा आएगा)

Sunil borrowed a sum of 30,000. He took a part of it at 12% and remaining at 10%. At the end of two years he returned 36480. what amount was borrowed at 12% Rate?

Solution:- SI for 2 yr = 6480

" " 1 yr = 3240

let all (30,000) invested at 10%.

SI = 30,000 × 10% = 3000

gap = 240

12% − 10% = 2%

2% → 240

100% → 12000

(जिसको मानेंगे वो नहीं आएगा)

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IF a sum of money becomes N_1 Times in T_1 yrs and N_2 times in T_2 years then

$$(N_1)^{T_2} = (N_2)^{T_1} \text{ OR } N_2 = (N_1)^{T_2/T_1}$$

A sum of money get doubled in 4 years. IN how much time it will become 8 times?

Solution:— I (FORMULA)

$N_1 = 2$, $T_1 \to 4$

$N_2 \to 8$, $T_2 = ?$

$N_2 = (N_1)^{T_2/T_1} \Rightarrow 8 = (2)^{T_2/4}$

OR $2^3 = (2)^{T_2/4} \Rightarrow T_2/4 = 3$

$\Rightarrow T_2 = 12$ yrs.

II (TRICKY)

2^1 गुणी $\longrightarrow$ 4]+4

2^2 times $\longrightarrow$ 8]+4

2^3 times $\longrightarrow$ 12

8 times — 12 yrs

कोई राशी 4% वृद्धि ब्याज की दर से 3 साल में 3 गुणी हो जाती है। कितने समय में यह राशि 81 गुणी हो जायेगी?

Solution:— I (FORMULA)

$N_1 \to 3$ $T_1 - 3$

$N_2 - 81$ $T_2 \to ?$

$N_2 = (N_1)^{T_2/T_1}$

$\Rightarrow 81 = (3)^{T_2/3} \Rightarrow 3^4 = 3^{T_2/3}$

$\Rightarrow T_2/3 = 4 \Rightarrow 12$ yrs

II (TRICKY)

3^1 times — 3]+3

3^2 times — 6]+3

3^3 times — 9]+3

$3^4 = 81$ times $\longrightarrow$ 12]+3

12 years Ans.

A Sum of money becomes 81 times in 4 years. in how much time it will become 27 times?

Solution:— I (FORMULA)

$N_1 - 81$, $T_1 - 4$.

$N_2 - 27$, $T_2 - ?$

$27 = (81)^{T_2/4}$

OR $\Rightarrow 27 = (3^4)^{T_2/4}$

$3^3 = 3^{T_2} \Rightarrow T_2 = 3$ yrs.

II (TRICKY)

	A	:	P
$T=4 \to$	81	:	1
$T=1 \to$	$\sqrt[4]{81}$	:	$\sqrt[4]{1}$
	3	:	1

$\therefore 3^1$ — 1 साल

3^2 — 2 साल

$27 = 3^3$ — 3 साल → Ans 3

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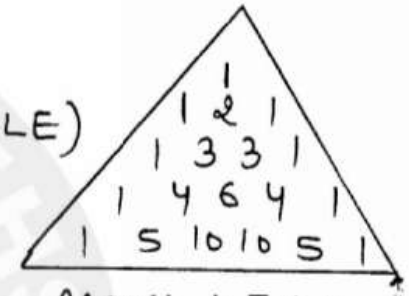
Different Techniques For Calculating CI

If $P = 20000$, $R = 10\%$ Per Annum, $T = 3$ yrs
find the compound interest $CI = ?$

Technique 1 (FORMULA METHOD)

$$CI = P\left[\left(1+\frac{R}{100}\right)^3 - 1\right] = 20000\left[\left(1+\frac{10}{100}\right)^3 - 1\right] = 6620$$

Technique 2 (PASCAL'S TRIANGLE)



PASCAL Δ FOR A

CI FOR 2 yrs $= 2A + B$
CI FOR 3 yrs $= 3A + 3B + C$
CI FOR 4 yrs $= 4A + 6B + 4C + D$
CI FOR 5 yrs $= 5A + 10B + 10C + 5D + E$

where $A = R\%$ of Principle [R% is Rate]
$B = R\%$ of A
$C = R\%$ of B, $D = R\%$ of C, $E = R\%$ of D

FOR Amount $A_2 = P + 2A + B$
$A_3 = P + 3A + 3B + C$
$A_4 = P + 4A + 6B + 4C + D$

Here $CI_3 = 3[10\% \text{ of } 20000] + 3[10\% \text{ of } 2000] + [10\% \text{ of } 200]$
$A = 2000$ $B = 200$ C
$= 3 \times 2000 + 3 \times 200 + 20 = 6620$ ANS.

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EXAMPLE SOLVED BY PASCAL TRIANGLE

$P = 5000$, $R = 5\%$, $T = 3$ yrs $CI = ?$

$CI_3 = 3A + 3B + C$

$A = 5\%$ of $5000 = ₹250$

$B = 5\%$ of $A = 5\%$ of $250 = 12.5$

$C = 5\%$ of $B = 5\%$ of $12.5 = .625$

$\Rightarrow CI_3 = 3 \times 250 + 3 \times 12.5 + .625 = 788.125$ ANS.

$P = ₹25000$, $R = 12\%$, $T = 3$ yrs, $CI = ?$

$CI = 3(A) + 3(B) + 1(C)$

$A = 12\%$ of $25000 = 3000$

$B = 12\%$ of $A = 12\%$ of $3000 = 360$

$C = 12\%$ of $B = 12\%$ of $360 = 43.2$

$\Rightarrow CI = 3 \times 3000 + 3 \times 360 + 43.2 = 10123.2$

$P = ₹25000$, $R = 10\%$, $T = 4$ yrs, $CI = ?$

$CI_4 = 4(A) + 6(B) + 4(C) + 1(D)$

$A = 10\%$ of $25000 = 2500$

$B = 10\%$ of $A = 10\%$ of $2500 = 250$

$C = 10\%$ of $B = 10\%$ of $250 = 25$

$D = 10\%$ of $C = 10\%$ of $25 = 2.5$

$CI_4 = 4 \times 2500 + 6 \times 250 + 4 \times 25 + 2.5 = 11602.5$ ANS.

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A man borrows Rs 4200 and undertakes to pay back with CI @ 10% p.a in two equal yearly installments at the end of 1st and 2nd year. what is the amount of each installment?

Solution :- $R = 10\% = \frac{1}{10}$ [but installment must be equal]

	P	Inst.
1st Yr	10 x 11	11 x 11
2nd Yr +	100	121
	210	121
	|x20	|x20
	4200	2420 Ans.

OR by FORMULA

$$4200 = \frac{x}{\left[1+\frac{10}{100}\right]} + \frac{x}{\left[1+\frac{10}{100}\right]^2}$$

$$\Rightarrow 4200 = x\left[\frac{10}{11} + \frac{100}{121}\right]$$

$$\Rightarrow 4200 = \frac{210x}{121} \Rightarrow x = 2420 \text{ Ans.}$$

A man borrows Rs 1820 and undertakes to pay back with compound interest @ 20% p.a. in 3 equal yearly installment at the end of 1st, 2nd and 3rd year. what is the amount of each installment?

Solution :- $R = 20\% = \frac{1}{5-p} \Rightarrow \text{Installment} = 5+1 = 6$

1st	5 x 36	6 x 36 = 216 } Installment must be equal
2nd	25 x 6	36 x 6 = 216
3rd	125	216 = 216
	455	216
	|x4	|x4
	1820	864 Ans.

A man borrows a certain sum of money and pays it back in two equal installments, IF CI is reckoned at 5% per annum and he pays back annually Rs 882. what sum did he borrow?

Solution :- $R = 5\% = \frac{1}{20}$

	P	I
1st	20 x 21	21 x 21 } [Installment must be equal]
2nd +	400	441
	820	441
	|x2	|x2
Ans	1640	882

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एक व्यक्ति 390300 ₹ की राशि को अपने दो पुत्रों में इस प्रकार निवेश करता है कि जब वे वयस्क हो तो उनको बराबर धन राशि प्राप्त हो जबकि उनकी आयु क्रमशः 13 वर्ष और 15 वर्ष है। यदि ब्याज की दर 4% वार्षिक चक्रवृद्धि हो तो प्रत्येक बेटे का हिस्सा बताइए?

Solution :- I (BASIC)

$$P_1\left[1+\frac{4}{100}\right]^5 = P_2\left[1+\frac{4}{100}\right]^3$$

$$P_1\left[\frac{26}{25}\right]^2 = P_2$$

$$\Rightarrow \frac{P_1}{P_2} = \frac{625}{676} \Rightarrow P_1 = \frac{390300}{1301} \times 625$$

$$= 187500$$

$$P_2 = \frac{390300}{1301} \times 676 = 202800.$$

II (TRICKY)

Rate = 4% = $\frac{1}{25}$

1st son	2nd son	
$(26)^2$	: $(25)^2$	
676	625	= 1301
| x300	| x300	| x300
202800	187500	390300

P = ?, R = 12.5%, T = 3 yrs

CI = 4340 (TOTAL)

Solution :- R = 12.5% = $\frac{1}{8}$

let P = $(D)^3 = (8)^3 = 512$

I	64			
II	64	8		
III	64	8	8	1

If CI → 64+64+64+8+8+8+1

= 217 ⇒ P = 512

20 x |		|x20
4340		10240

R = $14\frac{2}{7}$%, T = 2 year

CI for IInd year = 720

P = ?

Solution :- R = $14\frac{2}{7}\% = \frac{1}{7}$

Let P = $(D)^2 = (7)^2 = 49$

I = 7

II 7 +1 = 8

If $CI_2 \rightarrow 8 \Rightarrow P = 49$

	|x90	|x90
	720	4410

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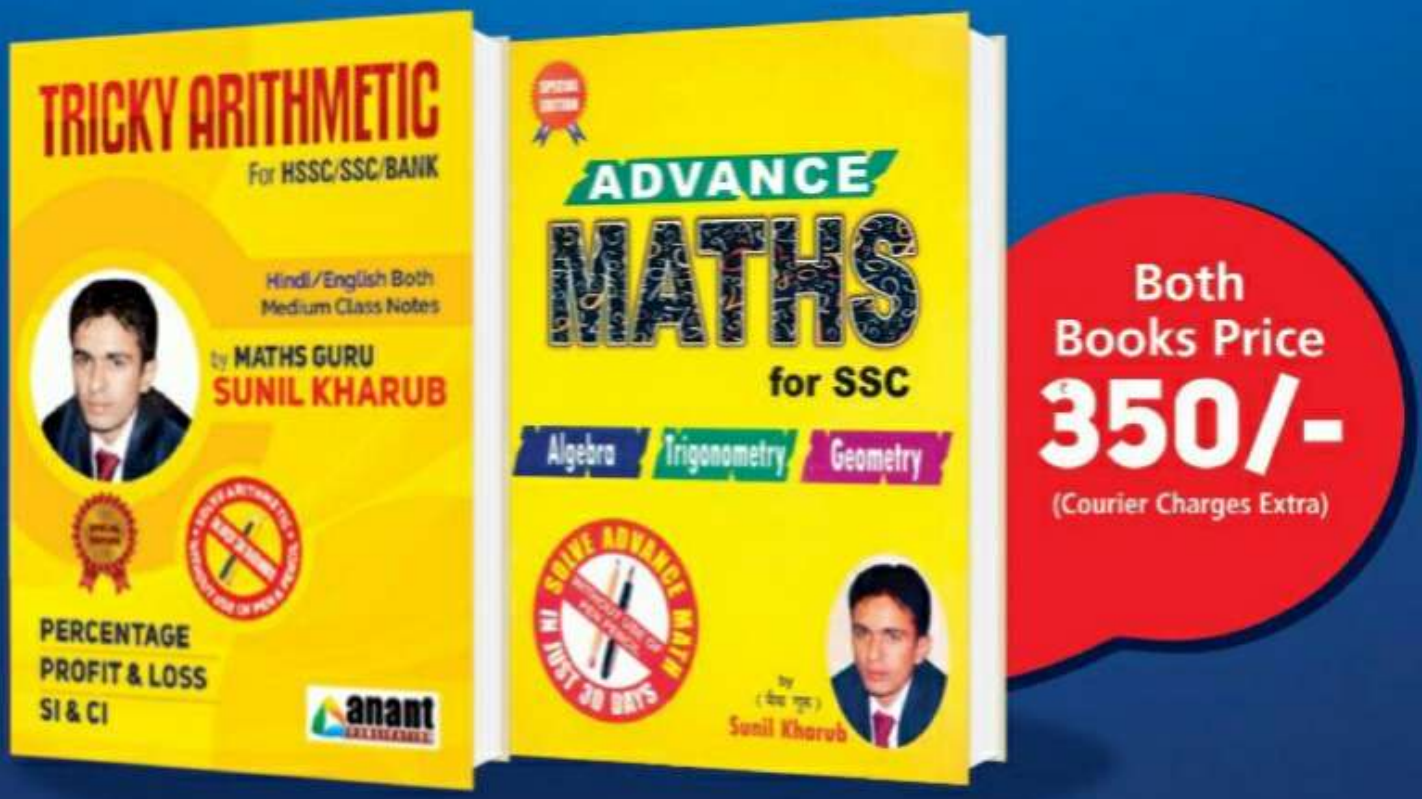
परीक्षा में सफलता पाने के लिए
मैथस गुरु "सुनील खरब"
द्वारा लिखित पुस्तकें अवश्य पढ़ें।



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